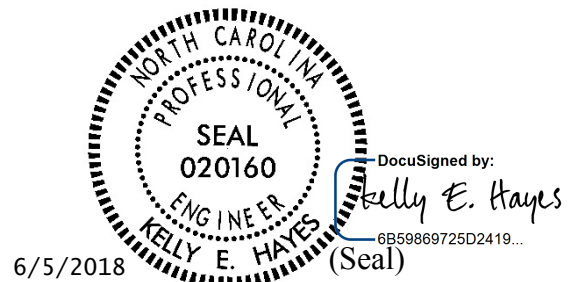


PROJECT SPECIAL PROVISIONS  
Utility Construction

SEPI Engineering & Construction, Inc.  
1025 Wade Avenue  
Raleigh, NC 27605



DOCUMENT NOT CONSIDERED FINAL  
UNLESS ALL SIGNATURES COMPLETED

**Revise the 2018 Standard Specifications as follows:**

**Page 15-1, Sub-article 1500-2 Cooperation with the Utility Owner, paragraph 2:**  
add the following sentences:

The utility owner is Orange Water and Sewer Authority(OWASA) located at 400 Jones Ferry Road Carrboro, NC 27510. The contact person is Nick Parker and he can be reached by phone at 919-537-4201 (Office).

**I. DESCRIPTION**

The work covered by these provisions only applies to OWASA facilities and consists of constructing various utilities as required by the plans and provisions herein or as directed by the Engineer. The Contractor shall furnish any and all materials, labor, equipment, and incidentals necessary to complete the proposed utility work.

Apply the applicable provisions of the Rules and Regulations of the North Carolina Department of Environment and Natural Resources, Division of Environmental Health to the construction of water lines. Apply the Rules and Regulations of the North Carolina Department of Environment and Natural Resources, Division of Water Quality to the construction of sanitary sewer lines except as otherwise provided. Perform all work in accordance with the applicable plumbing codes.

**II. GENERAL CONSTRUCTION REQUIREMENTS**

**Specifications:**

The proposed utility construction shall meet the applicable requirements of the **NC Department of Transportation's "Standard Specifications for Roads and Structures" dated January 2018**, all applicable permits, and OWASA specifications, OWASA standard details as shown on the plans, as outlined in the following provisions, or as directed by the Engineer.

Contact Orange Water and Sewer Authority(OWASA) for the current list of approved manufacturers product list. The contact person is Nick Parker and he can be reached by phone at 919-537-4201 (Office).

### III. COMPENSATION

No direct payment will be made for utility construction work required by the preceding provisions, which are general requirements applying to utility construction, and all of the requirements stated will be considered incidental work, paid for at the contract unit prices of the various utility items included in the contract. Measurement and payments for items shall be in accordance with the **NC Department of Transportation's "Standard Specifications for Roads and Structures" dated January 2018**, unless otherwise specified herein.

### IV. SPECIAL PAY ITEM DESCRIPTIONS

All materials, apparatus, supplies, methods of manufacture, or construction shall conform to the specifications for same contained in this section.

**Pages 2-30 thru 2-31; Section 265.** The Contractor's attention is directed to this section. Place and compact Select Material, Class VI (i.e. #57 stone) to encase existing or proposed utility lines, under Utility Manholes and around outside drop manhole assemblies for protection in areas as shown on the utility construction plans or as directed. All other requirements of Section 265 apply to Select Material, Class VI.

#57 Stone, Bedding Material and Select Material for Backfill are incidental to all other uses to the work being performed in the utility construction plans or as directed.

**Measurement and Payment:**

Select Material, Class VI (i.e. #57 stone) will be measured and paid in tons of select material, Class VI, measured in place.

Payment for Select Material, Class VI be per Ton and paid for under the contract price for "Select Material, Class VI". Such price and payments will be full compensation for all labor, materials, excavation, backfilling and any incidentals necessary to complete the work, as required. Select Material, Class VI will be measured and paid for under the contract item "Select Material, Class VI".

**Pay Item:**

Select Material, Class VI

**Pay Unit**

Ton

**Pages 15-16 and 15-17; Section 1530.** The Contractor's attention is directed to this section. An existing Manhole Vault is on -Y2- at approximate STA. 13+92.93, 23.53' Left. The proposed roadway grading requires the existing Manhole Vault to be abandoned.

Abandon manhole vaults in the construction limits by removing the top and walls of the manhole vault to the manhole vault spring line or to an elevation of 2 feet below the roadway subgrade, whichever is greater and filling the manhole vault with approved material.

Plug connecting utility pipes before filling or removing the manhole vault.

Removed frames and covers become the property of the Contractor for proper disposal.

**Measurement and Payment:**

Payment for abandoning manhole vaults shall be per each Abandon Manhole Vault and paid for under the contract price for "Abandon Manhole Vault". Such price and payments will be full compensation for all labor, materials, excavation, backfilling and any incidentals necessary to complete the work, as required. Abandon Manhole Vault will be measured and paid for under the contract item "Abandon Manhole Vault".

Grout used for plugging of abandoned utility pipe is incidental to the work being performed.

Utility pipe that is removed by other work of the contract will be incidental to the other work.

Abandon Manhole Vault will be measured and paid per each.

**Pay Item:**

Abandon Manhole Vault

**Pay Unit**

Each

**Pages 10-62 thru 10-64; Section 1036.** The Contractor's attention is directed to this section. It is the intent of this Special Provision to provide water pipe and fitting material specifications. All other requirements of Section 1036 apply to Water Pipe And Fittings.

Push-on and mechanical joint pipe shall be as manufactured by the American Cast Iron Pipe Company, Atlantic States Cast Iron Pipe Company, United States Pipe and Foundry Company, or Griffin Pipe Products Company.

**PIPE AND FITTINGS**

NOTICE: The use of STANDARD GASKETS WITH PUSH-ON PIPE IS NO LONGER PERMITTED for sizes less than 16 inches.

The following references provide the minimum standards as they apply to the specific item listed. In all cases, the latest revision shall apply.

**DUCTILE IRON PIPE**

Ductile iron pipe shall be manufactured in accordance with all applicable requirements of AWWA C151/ ANSI A21.51 for 4-inch and larger diameter pipe, pressure class rated, Class 350, minimum and shall be in 18 or 20-foot lengths. The thickness of Ductile Iron Pipe shall be determined by considering trench load and internal pressure (the pressure zone and variances in which the pipe will be used) separately in accordance with AWWA C150/ANSI A21.50.

The ductile iron pipe shall be cement mortar lined with a seal coat in accordance with AWWA C104/ANSI 21.4. Outside coat shall be a minimum of 1-mil bituminous paint according to AWWA C151/ANSI A21.51 Section 51-8.1.

Each joint of ductile iron pipe shall be hydrostatically tested before the outside coating and inside lining are applied at the point of manufacturer to 500 psi. Testing may be performed prior to machining bell and spigot. Failure of ductile iron pipe shall be defined as any rupture or leakage of the pipe wall.

All materials used in production of the pipe are to be tested in accordance with AWWA C151 for their adequacy within the design of the pipe, and certified test results are to be provided to NCDOT and OWASA upon request. All certified tests, hydrostatic and material are to be performed by an independent testing laboratory at the expense of the pipe manufacturer.

Push-on and mechanical joint pipe shall be as manufactured by the American Cast Iron Pipe Company, Atlantic States Cast Iron Pipe Company, United States Pipe and Foundry Company, or Griffin Pipe Products Company.

#### **DUCTILE IRON JOINTS:**

Pipe joints shall be restrained by either mechanical joint or manufactured restrained joint system, as outlined in number 3) below. The use of restraining gaskets shall be permitted. This applies to all pipe sizes 4 inch through 12 inch. Pipe 16 inch and larger shall be as approved by the OWASA Engineer. Acceptable types of pipe joints are as follows:

- a. Push-on Joint, Ductile Iron Pipe THE USE OF STANDARD PUSH-ON GASKETS IS NOT PERMITTED! The pipe shall conform to AWWA C151/ANSI A21.51 (such as "Fastite," "Tyton," or "Bell-Tite."). The dimensions of the bell, socket, and plain end shall be in accordance with the manufacturer's standard design dimensions and tolerances. The gasket shall be of such size and shape to provide an adequate compressive force against the plain end and socket after assembly to affect a positive seal. Gaskets shall be manufactured of an acceptable elastomeric material, and comply with AWWA C111/ANSI A21.11. and shall be as manufactured by American Pipe (Fast-Grip), Griffen Pipe (Talon RJ), US Pipe (Field Lok 350), Atlantic States (Sure Stop 350)
- b. Mechanical Joint, Ductile Iron Pipe and Tee Bolts
  - i. The mechanical joint shall consist of:
    - a) A bell cast integrally with the pipe or fitting and provided with an exterior flange having cored or drilled bolt holes and interior annular recesses for the sealing gasket and the spigot of the pipe or fitting;

- b) A pipe or fitting spigot;
  - c) Rubber EPDM material and comply with AWWA C110/ANSI A21.11 sealing gasket;
  - d) Separate ductile iron follower gland having cored or drilled bolt holes; as outlined in number 3) below.
  - e) Stainless steel Tee Head bolts and hexagon nuts. All threads are Coarse-Thread Series Class 2A, External and Class 2B, Internal, per ANSI B1.1. Nuts to be furnished in accordance with ASTM F594. Use of a stainless steel anti-seize compound is required or specially coated nuts to prevent galling.
- ii. The joint shall be designed to permit normal expansion, contraction, and deflection of the pipe or fitting while maintaining a leak proof joint connection. The mechanical joint shall conform to the requirements of Federal Specification WW-P-421, AWWA C111/ANSI A21.11, and ASTM A536, *Standard Specification of Ductile Iron Castings*.
  - iii. Tee bolts and nuts: All tee bolts shall be 304 or 316 stainless steel with either a coated heavy hex nut, or the use of stainless steel anti-seize compound, to prevent galling. Bolts shall conform to AWWA C111/ANSI A21.11. This requirement supersedes all other bolt references in the standard. Only bolts and nuts that are 304, or 316, stainless steel shall be permitted for use in the OWASA jurisdiction.
- iv. Mechanical Joint Bolt Torque:

Where mechanical joint fittings are required, unless otherwise advised by the manufacturer, the minimum bolt torque shall comply with Table 2 of AWWA C600 for mechanical joints, as follows:

Bolt Size (Inches)	Torque (Ft-Lbs)
5/8	45-60
3/4	75-90
1	100-120
1 1/4	120-150

- c. Mechanical Joint Restraint: Acceptable types of joint restraints shall be:
  - i. Restrained Joints shall consist of the use of a mechanical joint restraint system, using Megalug series 1100 mechanical joint restraint by EBAA Iron Sales, Inc., Ford wedge action restrainer gland UFR Series 1400, Sigma One-Lok, Tyler Union TUF Grip, or approved equal. Bolt heads are to be “auto-torque” twist off. Auto-torque twist off bolts are exempt from the stainless steel requirement. See Standard Detail 512.08, sheet 2 of 2 for figure of Megalug.

- ii. Restrained Joint Pipe shall be TR Flex or Lok Tyte as manufactured by United States Pipe and Foundry Company, Flex-Ring or Lok-Ring as manufactured by American Cast Iron Pipe Company, Snap-lok as manufactured by Griffin Pipe Products Company.
- iii. Concrete thrust blocking and rodding is required for connection to all existing water mains or as shown on plans.
- d. Flanged Joints shall be firmly bolted with machine bolts; however, where valves or special fittings are attached to a flange pipe, stud or tap bolts may be used, providing the number used and diameter for each joint is the same for each respective size of pipe, specialty, or valve, as recommended by the latest AWWA Standard for flanged drilling. Bolts are specified in ANSI B18.2.1 and nuts are specified in ANSI B18.2.2. Bolts and nuts are to be cold worked 304 stainless steel meeting ASTM F593 *Standard Specification for Stainless Steel Bolts, Hex Cap Screws and Studs* for sizes up to 1.5 inches. Stainless steel bolts and nuts shall have a minimum yield strength of 50,000 psi. For high strength applications, use 304L stainless steel bolts. Bolts shall be of sufficient length to pass through two flanges and the nut threads shall be accurately cut, close fitting, and the prevailing standard. Bolt heads shall be cut square and nuts hexagon in shape, both the heads and nuts being chamfered. Gaskets to be of 1/8-inch thick plain rubber (Styrene Butadiene [SBR]) per AWWA C110/ANSI A21.11 or equal as approved by NCDOT and OWASA's Engineer.

#### DUCTILE IRON FITTINGS:

Fittings shall be ductile iron, grade 70-50-05, and shall conform to AWWA C110/ANSI A21.10 or AWWA C153/ANSI 21.53 for compact fittings, pipe sizes 4 inches through 48 inches with the exception of manufacturer's proprietary design dimensions and thicknesses for iron, in accordance with AWWA C110/ANSI A21.10. All ductile iron fittings shall have a minimum working pressure rating of 350 psi and shall be cement mortar lined and bituminous coated (minimum 1- millimeter), in accordance with AWWA C104/ANSI A 21.4. The fittings shall be tested and the manufacturer shall provide certified test results when requested by OWASA. This testing shall include hydrostatic proof testing of fittings. Glands, gaskets, and bolts shall conform to AWWA C111/ANSI A 21.11. The use of push on fittings is not permitted. Acceptable manufacturers are: American Cast Iron Pipe Company, Griffin Pipe Company, Union/Tyler Pipe Company, or U. S. Pipe & Foundry Company. Acceptable types of fittings are:

- a. Full Body Mechanical Joint Fittings: Full body ductile iron mechanical joint fittings shall be class 250 minimum and shall conform to AWWA C110/ANSI A21.10. Glands, Gaskets and Bolts shall conform to AWWA C111/ANSI A21.11.
- b. Mechanical Joint Fittings – Compact: Compact fittings shall be minimum class 350 and shall comply with AWWA C 153/ANSI A21.53, pipe sizes 4 inches through 48 inches. Glands, Gaskets and Bolts shall conform to AWWA C111/ANSI A21.11.
- c. Mechanical Joint Restraints: Joint restraints shall consist of the use of a Megalug joint

restraint system using Megalug series 1100 mechanical joint restraint by EBAA Iron Sales, Inc., Ford wedge action restrainer gland UFR Series 1400, Sigma One-Lok, Tyler Union TUF Grip, or approved equal. Bolt heads are to be "auto-torque" twist off. Auto-torque twist off bolts are exempt from the stainless steel requirement. See Standard Detail 512.08, sheet 2 of 2 for figure.

## VALVES AND FIRE HYDRANTS

### GATE VALVES

- 1) Gate Valves, Resilient Wedge (2 inches through 12 inches): All gate valves shall be iron body of the resilient wedge type complying with AWWA C509 and shall be UL listed and FM approved for a working pressure of 200 psi. All internal parts shall be accessible without removing the body from the line. The wedge shall be of cast iron completely encapsulated with resilient material. The resilient sealing material shall be permanently bonded to the cast iron wedge with a rubber-tearing bond to meet ASTM D429 Standard Test Methods for Rubber Property-Adhesion to Rigid Substrates and AWWA C550.

Non-Rising Stems (NRS) shall be cast bronze with internal collars in compliance with AWWA. OS&Y stems shall be bronze. The NRS stuffing box shall have two "O"-Ring seals above the thrust collar. These rings shall be field replaceable without removing the valve from service.

Each valve shall be hydrostatically tested at 400 psi to the requirements of both AWWA and UL/FM.

All gate valves 4 through 12 inches shall be of the mechanical joint type. 2- inch gate valves shall be iron pipe threads.

All bolts and nuts shall be stainless steel.

Valves shall open counter-clockwise (left) and shall be equipped with a 2-inch square AWWA operating nut.

The valve body and bonnet shall be coated interior and exterior with fusion bonded thermosetting plastic or epoxy. ALL RUBBER GASKETS AND O- RINGS SHALL BE MANUFACTURED WITH AN APPROVED ELASTOMER.

Acceptable gate valves, sizes 4-inch through 12 inches, shall be:

American Flow Control	Model Series 2500SS
Clow (M&H)	Model F-6100
Mueller	Model A-2360-20

All resilient seat gate valves furnished for a project shall be from the same manufacturer.

- 2) Inserting Valves: Inserting valves shall meet requirements of gate valves specified above for valve mechanism and AWWA C110/ANSI A21.10 for the sleeve for pressure ratings shown on the drawings.

### **COMBINATION AIR VACUUM VALVE**

Automatic Air and Vacuum Valves shall be infinitely variable automatic air and vacuum valves designed to allow escape of air, close watertight when liquid enters the valve and allow air to enter in the event of a vacuum. The valve shall be a NPT threaded Stainless Steel body. The valve outlet is to be protected from debris entering the outlet of the valve. Valves shall be all brass. Valves shall be designed for a maximum cold water pressure of 200 psig. Combination air and vacuum release valves shall be located as shown on the drawings or as otherwise directed by OWASA's Engineer. The valve shall be housed in a precast concrete eccentric manhole and shall be installed in accordance with Standard Detail 538.01. Acceptable Models are, X-Series (1 or 2 inch outlet) by Crispin-Multiplex Manufacturing Co. and 986 Stainless Steel by H-Tec Inc.

Manhole units shall consist of standard modular precast riser sections, modular riser sections, and a doghouse base. Where conditions do not favorably accommodate the use of an eccentric cone, eccentric precast reinforced concrete flat tops are to be used. See Standard Detail 513.04.

### **TAPPING SLEEVES AND VALVES**

The tapping sleeve and valve shall be suitable for wet installation without interrupting water service.

Iron Body Tapping Sleeve: The sleeve body shall be of split type, full body ductile iron construction with mechanical joint ends and epoxy coating (10 mil minimum) for AC sleeves. The sleeve shall be suitable to fit the type and class of pipe being tapped. The mechanical joint type shall have longitudinal compound (EPDM) rubber gaskets that fit against the rubber end gaskets effecting a totally enclosed rubber, watertight seal. Side and end bolts shall be stainless steel. Tapping sleeve shall meet the requirements of AWWA C110/ANSI 21.10. For asbestos cement pipe, the Contractor shall measure the diameter of the pipe prior to selecting a tapping sleeve to ensure the sleeve will fit the pipe (this information shall be provided to OWASA on the as-built drawings). See Standard Detail 512.04.

Acceptable tapping sleeves are listed below:

American Flow Control	Model 2800-C for CI to PVC Model 2800-A for AC
Mueller	Model H-615 for CI to PVC Model H-619 for AC
Tyler/Union	For CIP/DIP to DIP

Tapping Valves: Resilient seat tapping valves shall be epoxy coated (minimum 10 mil thickness) and otherwise meet the requirements of Section 2.2.1, *Gate Valves*, except that the seat openings



shall be larger than nominal size with a raised alignment ring on the flange. Valve ends shall be mechanical joint by flange. Valves shall open counter-clockwise (left) and shall have a 2- inch operator nut. See Standard Detail 512.04.

All bolts and nuts are to be stainless steel.

Tapping valves shall be an "O" ring type mechanical joint end conforming to AWWA non-rising stem construction. Inlet flange end shall be Class 125 (ANSI B16.1). ALL RUBBER GASKETS AND O-RINGS SHALL BE MANUFACTURED WITH AN APPROVED ELASTOMER.

Acceptable resilient seat tapping valves are listed below:

American Flow Control	Model 2500-TM
Clow	Model F-6114
Mueller	Model T-2360

## **FIRE HYDRANTS**

See Standard Details 514.02 and 514.03. ALL RUBBER GASKETS AND O-RINGS SHALL BE MANUFACTURED WITH AN APPROVED ELASTOMER. ALL BRASS PRODUCTS SHALL BE LEAD FREE AND COMFORM TO NSF61-ANNEX G IN CONJUNCTION WITH NSF372 REQUIREMENTS. Fire hydrants shall comply with ANSI/AWWA C502, latest revision, UL 246 and FM1510. Hydrants shall be hub end, triple nozzle, improved AWWA type. Interior coating to be in accordance with AWWA C550. Minimum working pressure shall be 250 PSI working pressure in ALL pressure zones. Hydrants shall consist of the following:

- a. Two 2½-inch fire nozzles and one 4½-inch steamer nozzle, National Standard hose threads.
- b. All nozzles shall be provided with caps and chains.
- c. The hydrant valve opening shall be 5¼ inches.
- d. Bronze to bronze threads shall be provided between the hydrant seat or seat ring and the seating attaching assembly.
- e. All hydrants must include cast or ductile epoxy lined shoe (minimum 4 mils), rubber drain seals and positive protective valve stop device.
- f. Hydrants shall open left and shall have a National Standard pentagon- type operating nut (1 ½" point to flat). The operating nut shall be of one- piece bronze construction. A thrust washer shall be supplied between the operating nut and stem lock nut. The valve stem shall have a safety flange and a safety coupling.
- g. Hydrants shall have a 6-inch hub-end or mechanical joint elbow.
- h. The hydrant barrel shall be of sufficient length to provide a minimum bury of 4 feet.
- i. Hydrants shall be of the compression type closing with line pressure and shall be of the traffic model breakaway type.

- j. Hydrant cap and stuffing box shall be of unitized, one-piece design creating a watertight cavity without the use of gaskets. The combination of O-Rings to a crimped brass ferrule around the stem shall seal the cavity from contact with water. Hydrant caps shall have a means for providing periodic lubrication of the operating threads.
- k. The main valve shall be of synthetic rubber reinforced with steel. The seat shall be of a bronze ring threaded to a bronze insert in the hydrant shoe, with O-Rings to seal the drain way and barrel from leakage of water in the shoe.
- l. The hydrant drain hole shall momentarily force flush with each operation.
- m. All hydrant extension kits, flange kits, stems, couplings or other repair parts must be of the original hydrant manufacturer. Only one 24-inch extension kit is allowed.
- n. Hydrants are to be painted in accordance with Standard Detail 514.01. Barrels are to be painted red with the caps and bonnet painted reflective silver.
- o. If line is to be pressurized within 7 days of setting hydrant, then 4000-psi high early strength concrete shall be used.

Approved fire hydrants including model and manufacturer are listed below:

Clow (M&H)	Model F-2545 Medallion
Mueller	Model A-423 Super Centurion 250
American Flow Control	Model B62B Traffic Model (Long Barrel)

All hydrants furnished for a project shall be from the same manufacturer.

## **BLOW OFFS**

Blow-Off Assembly for Future Extension: Blow-off assemblies for future extensions shall consist of two standard valve boxes, one for a NRS gate valve and one for a 2-inch brass pipe riser (see Standard Detail 514.05), thrust collar, a push-in plug tapped for 2-inches, a 2-inch brass pipe riser with a 2-inch threaded male threaded plug.

## **CORPORATION STOPS**

ALL BRASS PRODUCTS SHALL BE LEAD FREE AND COMFORM TO NSF61- ANNEX G IN CONJUNCTION WITH NSF372 REQUIREMENTS. ALL RUBBER GASKETS AND O-RINGS SHALL BE MANUFACTURED WITH AN APPROVED ELASTOMER. Corporation stops for  $\frac{3}{4}$ -inch and 1-inch taps only shall be all bronze CC tapered threaded inlet by flare copper outlet, as manufactured by Ford or Mueller. Acceptable corporation stops shall be the Ford FB600-(3 OR 34)-NL Series or the Mueller B25000N Series. 2-inch corporation OR BALL stops are not permitted. See Standard Detail 512.06.

## **MANHOLE FRAME AND COVERS**

Manhole frames and covers shall be meet ASTM A48 *Standard Specification for Gray Iron Castings*, Class 30, traffic frame and cover as manufactured by Capitol Foundry, US foundry or

East Jordan Iron Works. Cover shall read OWASA, "WATER" in the center and "DANGER ENTRY PERMIT REQUIRED" around the circumference. See Standard Detail 516.01. Provide four 1-inch diameter holes in the top at each compass point.

Weights shall not vary more than 5% +/- of the weight shown on Standard Detail 516 .01.

Acceptable Manufacturers and models are:

Capitol Foundry	Model MH-2001
US Foundry	Model USF-669
East Jordan Iron Works	Model V-1384

## VALVE BOXES

Adjustable valve boxes shall be US made gray cast iron of the dimensions shown in Standard Detail 513.01 (*2-Piece Adjustable Screw Valve Box and Cover Detail*) of these specifications. Lids shall be heavy-duty traffic weight with the word "WATER" cast into the lid. Provide cast-iron telescoping top section of length required for depth of burial of valve and bottom section with base of size to fit over valve. Acceptable valve boxes are: Charlotte Pipe and Foundry Company Figure UTL 273 or Tyler Pipe Company 6850 Series or approved equal.

## MEASUREMENT AND PAYMENT

The Water Pipe And Fittings will be incidental and will be paid at the contract unit prices of the various utility items included in the contract.

**Pages 15-5 thru 15-7; Section 1510.** The Contractor's attention is directed to this section. It is the intent of this Special Provision to provide execution of water line construction. All other requirements of Section 1510 apply to Water Lines.

## CONNECTIONS TO EXISTING MAINS:

The Contractor shall furnish all materials for connection to existing water mains. THIS INCLUDES ALL RODDING, BLOCKING AND BRACING NECESSARY TO PLACE WATER MAIN INTO SERVICE AS SOON AS TIE-IN IS COMPLETE. OWASA shall be the sole operator of all EXISTING valves and fire hydrants.

In making connections to the existing distribution system, valves shall be set as shown on the plans.

Before shutting off any main, residents are to be notified by an OWASA representative in writing 48 hours in advance of cut off. The Contractor shall provide assistance to OWASA in notification distribution.

If connection to an existing main requires a wet tap, such tap shall be performed by OWASA. Fees must be paid 48 hours in advance of tapping the main. Contractor is responsible for traffic control, excavating, dewatering, and safe access in the trench at the time of tap. The contractor is to provide tapping sleeve and valve. Contractor must have approved traffic control plan.

Work shall be scheduled at least one week in advance through OWASA's inspector. A crewman from the OWASA Distribution and Collections Division shall be present during the operation. After installation of the tapping sleeve and valve and prior to performing the tap, the assembly shall be air tested at 100 psi. Such pressure shall be maintained with no loss for a minimum time of 5 minutes.

### **TAPPING SLEEVES AND VALVES**

Tapping sleeves and valves shall be installed in accordance with the manufacturer's recommendations at locations shown on the plans. With prior approval, when taps are made on asbestos cement pipe, the Contractor shall excavate at the location of the tap and measure the diameter of the pipe prior to selecting a tapping sleeve to ensure the sleeve will fit the pipe (this information shall be provided to NCDOT and OWASA on the as-built drawings). See Standard Detail 512.04. Taps shall be performed by OWASA. Fees must be paid 48 hours in advance of tapping the main. Contractor is responsible for traffic control, excavating, dewatering, and safe access in the trench at the time of tap. The contractor is to provide tapping sleeve and valve. Contractor must have approved traffic control plan.

Work shall be scheduled at least one week in advance through OWASA's inspector. A crewman from the OWASA Distribution and Collections Division shall be present during the operation. After installation of the tapping sleeve and valve and prior to performing the tap, the assembly shall be air tested at 100 psi. Such pressure shall be maintained with no loss for a minimum time of 5 minutes.

### **AIR RELEASE VALVES**

Air release valves are to be used to bleed air during filling of a water line and to automatically vent air that collects in the water lines. Pressure air release valves shall be located as shown on the drawings. The valve shall be housed in a precast concrete eccentric manhole and shall be installed in accordance with Standard Detail 513.04. All pipe and fittings are to be brass including the plumbing gate valve. Air release valve locations shall be as shown on the plans and or as otherwise directed by NCDOT and OWASA's Engineer.

### **FIRE HYDRANTS**

Construction: Fire hydrants shall be installed where shown upon the plans. Hydrants shall be set upon a concrete setting slab in such manner as to preclude the possibility of settlement of hydrants. Place loose #57 stone around the hydrant elbow. See Standard Detail 514.03.

Hydrants are to be located at a distance from the curb or edge of pavement to provide ready access and minimize the possibility of damage from vehicle and set to the height prescribed by Standard Detail 514.03 with the pumper nozzle facing or pointing to the street or fire access lane. Care shall be taken to keep concrete away from bolts and weep holes. Hydrants must be set with the stem vertical/plumb and the flange above grade. The Contractor is responsible for determining barrel length and ordering to meet conditions. Where adjustments in height are needed, provide extension kits at no additional cost. However, only one 24-inch riser extension is allowed per hydrant. Where hydrants are set behind guardrails, the pumper nozzle shall be set with its centerline a minimum of 12 inches and a maximum of 18 inches above the top of the guardrail.

An NCDOT and OWASA representative must inspect fire hydrants prior to backfilling.

Operation and Painting: Hydrants, upon installation and prior to acceptance of the project, shall be painted and greased, the caps are to be greased with a food grade anti-seize lubricant after installation, and individually operated in front of an NCDOT and OWASA representative to verify the hydrant is greased and in working condition. Paint is to be Sherwin Williams Industrial Enamel or equal. The hydrant barrel is to be painted red with the caps and bonnet painted reflective silver. See Standard Detail 514.01. Do not remove chains.

#### Hydrant Bagging:

- a) New Hydrants: Place a heavy-duty orange plastic bag over newly installed fire hydrant until hydrant is placed in service and accepted by NCDOT and OWASA.
- b) Out of service Hydrants: During times when a fire hydrant is taken out of service, such as when it has been replaced with a new hydrant, or when it is abandoned, place a heavy-duty orange bag on hydrant.

#### Valving of Main

A resilient seat gate valve shall be installed 30 inches from the fitting of the main and properly restrained. Provide a concrete stabilizing pad in accordance with Standard Detail 513.02.

Fire hydrants are to be pressure tested with the main.

Tapping Sleeve Support – AC Pipe: A concrete pad shall be poured under tapping sleeves placed on AC pipe to support the weight of the tapping sleeve and valve. Wrap sleeve with plastic to protect bolts and nuts. Care shall be taken to ensure that bolts and nuts are free of concrete and debris to allow accessibility for future repairs. An NCDOT and OWASA representative must inspect all blocking prior to backfilling.

#### **RESTRAINTS/CONCRETE THRUST BLOCKING**

- 1) Thrust Blocking: Thrust Blocking SHALL be installed at the direction of the NCDOT

and OWASA Representative or as shown on the plans. Thrust blocks shall be constructed from 3000 psi concrete (at 28 days) and poured against an undisturbed earth trench wall. Concrete thrust blocking shall be constructed in accordance with Standard Detail 512.02. Sacrete is not permitted. Concrete anchors may be unformed but minimum dimensions must be maintained. All fittings and pipe shall be wrapped in plastic prior to installation of concrete to insure that bolts and nuts are free of concrete and debris to allow accessibility for future repairs. When soft, mucky, unsuitable, or unstable soils are encountered, thrust shall be resisted by running tie rods to solid foundations by removing the soft materials and replacing it with ballast of sufficient size and weight to resist thrust.

Vertical upward thrust at fittings or vertically deflected joints shall be resisted with thrust collars of adequate size and weight to resist thrust. See Standard Detail 512.01.

Pipe manufacturer's installation manuals shall be followed for the anchoring of valves and fittings in difficult locations unless superseded by the requirements of these specifications.

Concrete thrust blocking is not recommended where the blocking may bear on other utilities or where the area behind the block may be excavated in the future.

An NCDOT and OWASA representative must inspect all blocking and anchoring prior to backfilling.

- 2) Rodding: 4-inch and larger valves and assemblies of fittings shall be secured to a blocked fitting by threaded rods with eyebolts. Refer to Standard Detail 512.09 for the minimum size and number of rods needed for various test pressures. No more than one coupling shall be allowed between rods. Rodding length between fittings shall not exceed 20 feet. When the length between fittings exceeds 20 feet, place a thrust collar on the line and rod to the thrust collar.

All eyebolts, nuts and threaded steel rods shall be 304 or 316 stainless steel.

- 3) Thrust Collars: Thrust collars shall be constructed as shown in Standard Detail 512.08 for pipes up through and including 36 inches in diameter. The thrust collar shall consist of a wedge action restrainer gland placed around a joint of ductile iron pipe encased in a reinforced 3000 psi concrete block. Where the blocking provides thrust resistance for fittings, threaded rods shall be connected to the restraint flange fitting secured to a full joint of ductile iron pipe. On dead end lines, the thrust collars must be placed on a full joint of ductile iron pipe just after the terminal end line valve.

#### ACCEPTANCE TESTS:

- a. Pressure Test: Subject the pipe system to a hydrostatic pressure test. Raise the pressure by pump to 200 psi, 150% of system design working pressure, or test pressure as shown on the drawings, whichever is greater. Measure pressure at the high point on the system

compensating for gauge elevation. A pressure loss greater than 5 psi over a 2 hour period results in an automatic failure of test. Pressure loss less than 5 psi (between 200 and 195 psi) is acceptable if the allowable leakage permitted (shown in table 5A AWWA 600-05 SECTION 5.2) is not exceeded. All water used to determine the amount of leakage shall be measured thru a water meter (measuring in tenths of a gallon) approved by the NCDOT and OWASA Representative. Tests that exceed the allowable leakage are deemed failed and the Contractor shall determine cause, repair, and repeat the test until successful. Contractor shall be responsible for all labor, materials, and equipment to perform the testing.

- b. Leakage Test: Leakage shall be defined as the quantity of water that must be supplied into the pipe to attain the initial test pressure, after all air in the pipeline has been expelled and the pipe has been tested for duration of 2 hours. Leakage shall not exceed the quantity determined by Table 5A (shown in AWWA C600-05).

If leakage exceeds allowances, the Contractor shall be responsible for locating and repairing leaks, and retesting of line until successful.

No leakage will be allowed for 2 inch mains regardless of material.

## DISINFECTION

Pipe Disinfection: Comply with ANSI/AWWA C-651, *Disinfecting Water Mains*. The Contractor shall disinfect water mains and accessories in accordance with the procedures listed in AWWA C-651 and meet the requirements of NCDOT and OWASA, whichever is more stringent.

### 1) FORMS OF CHLORINE FOR DISINFECTING:

- a. Calcium hypochlorite – two forms are available – granular and tablets (both with 65% available chlorine). It will normally require 6.5 lbs. of Calcium Hypochlorite to produce a concentration of 50mg/L of available chlorine in 10,000 gallons of water. (Warning Note: *This chemical must not be used on solvent-welded or on screwed-joint steel pipe because of the danger of fire or explosion from the reaction of the joint compounds with the calcium hypochlorite!*)
- b. Sodium hypochlorite – is supplied in strengths of 5.25% to 16% available chlorine. The required amount of sodium hypochlorite to produce a 50mg/L concentration of available chlorine in 10,000 gallons of water can be calculated from the following formula:

Gallons of Sodium Hypochlorite needed =  $50 \div \% \text{ of available chlorine}$

**2) METHODS OF CHLORINE APPLICATION:**

The Contractor will inject a chlorine solution as specified in AWWA Standard C651, latest revision, into the water main. Chlorination shall be in accordance with the following guidelines for calcium hypochlorite granules:

Pounds of Calcium Hypochlorite granules per 1000 feet of pipe to provide 100 ppm

6-inch diameter pipe	1.9 lbs.
8-inch diameter pipe	3.33 lbs.
12-inch diameter pipe	7.5 lbs.

- a. The chlorine solution shall be injected in the section of the main nearest an existing main. The chlorine solution shall result in a chlorination concentration of 100 ppm or greater. Chlorine injected on Friday yielding a 48 contact time of 20ppm must be achieved or samples cannot be collected, on a case by case basis 50 ppm chlorine concentration with a 24 hour contact time yielding 20 ppm may be accepted. Manually operated pumps shall not be used to inject the solution into the main.
- b. Application for Continuous Feed and Slug Method.

Taps will be made at the control valve at the upstream end of the line and at all extremities of the line including valves. These taps shall be located in such a manner as to allow chlorine solution to be fed into all parts of the line.

The chlorine solution shall be circulated in the main opening of the control valve while systematically manipulating hydrants and taps at the line extremities. The chlorine solution must be pumped in at a constant rate for each discharge rate in order that a uniform concentration will be produced in the lines.

- c. Continuous feed method- potable water shall be introduced into the pipe main at a constant flow rate. Chlorine shall be added at a constant rate to this flow so that the chlorine concentration in the water in the pipe is 100mg/L. The chlorinated water shall remain in the main at 48 hours, after which, the chlorine concentration in the water shall be at least 20mg/L. All valves and appurtenances shall be operated while the chlorinated water remains in the main.
- d. Slug method – Shall be as described in AWWA C-651 SECTION 4.4.4 and the following requirement. The water shall receive a chlorine dosage, which will result in a chlorine concentration of 100mg/L in a “slug” of the water.

**BACTERIOLOGIC TESTS-GENERAL:**

Before the water main is placed in service, all samples shall be collected at regular intervals not exceeding 1,200 feet and tested for bacteriologic quality and shall show the absence of both background growth (gram positives) and coliform organisms.



- a. Bacteriological testing shall comply with Section 5 of AWWA C651. All samples shall be tested for bacteriological (chemical and physical) quality in accordance the Standard Methods for the Examination of Water and Wastewater, and shall show the absence of coliform organisms and the presence of chlorine residual.
- b. Purity Testing includes a series of tests that must be taken on two consecutive days. Samples cannot be collected if any type of precipitation is falling unless, an acceptable protective covering (approved by the NCDOT and OWASA Representative) is constructed suitable to prevent contamination.
- c. All sampling pipe shall be either brass or PVC and as shown in detail #514.07, 514.08 and 514.09.
- d. The Contractor is responsible for furnishing all material, construction of sampling points and performing all labor associated with collecting samples. Temporary pipes used for sampling shall be composed of sections of vertical pipe terminating into a 90-degree horizontal bend and nipple at least 18 inches above ground level. Copper tubing used for sampling shall terminate horizontally with the ground, at least 18 inches above ground level. Samples will not be taken from a hose.
- e. OWASA's representative will prepare a Sampling Log, including a sketch of the sampling points, as specified by OWASA's chemist. An OWASA Representative will collect the samples and deliver them to the OWASA Laboratory. Day 1 samples can be taken on Monday and Tuesday during regular business hours. Day 1 samples cannot be collected on Wednesday. Day 2 samples collected on Wednesday must be received in the laboratory by 3:00 p.m. The normal turnaround time for OWASA's laboratory to acquire results is 3 working days.
- f. Sampling Costs: Samples will be taken at each discharge point for Day 1 and Day 2 sampling free of charge. If purity testing fails on either Day 1 or Day 2, OWASA's Inspector will resample each discharge point at no cost. However, a charge will be assessed after the second set of samples has failed. Cost will be based on time, travel, equipment and material used/expended to collect and obtain results.

Samples for bacteriological analysis shall be collected in sterile bottles treated with sodium thiosulfate. Day 1 results will not be available until 24 hours after sample has been run by lab. If laboratory results indicate the presence of coliform bacteria, the samples are unsatisfactory. If laboratory results indicate background growth masking the detection of coliform bacteria, the sample will be considered unsatisfactory. If the line fails either day 1 or day 2 sampling, the main shall be re-chlorinated by the Contractor and new tests performed prior to moving to the next section of main. OWASA will furnish water and operate the control valves for these operations. The Contractor shall be responsible for loading, removal, hauling, and, discharging of water.

Samples for bacteriological analysis shall be collected for each section of pipe

between main line valves after flushing is completed.

Primary sampling points are blow-offs, 2-inch setters and all fire lines. Sampling will be allowed at hydrants only if no other acceptable sampling point is available. All work required shall be at the Contractor's expense.

#### **NEW WATER MAIN DISINFECTION AND PURITY TESTING – PROCEDURE:**

##### **STEP 1: Disinfection**

The Contractor is responsible for furnishing all taps and materials required to satisfactorily disinfect the water system. All sample points shall be setup as shown in detail# 514.07, 514.08 or 514.09 as applicable.

The following steps will be completed by OWASA and the Contractor cooperatively.

- a. OWASA's representative along with NCDOT's representative will witness the flushing of the section of main to be disinfected until turbidity readings indicate 1.0 or less NTU.

##### **Minimum Blow-Off Sizes**

For 2" – 8" lines, use 2" blow-offs.

For 12" lines, use 4" blow-offs.

The Contractor is responsible for adequate disposal of the large volumes of water generated from flushing and de-chlorinating.

- b. The Contractor will inject a chlorine solution as specified into the water main.
  - i. Do not use manually operated pumps to inject the solution into the main.
  - ii. The chlorine solution shall result in a chlorine concentration of 100 ppm or greater.
  - iii. The chlorine solution should be injected in the section of main nearest an existing water main.
- c. NCDOT and OWASA's representative will witness water being drawn from the following areas until 100 ppm chlorine concentration has been measured at all points of discharge at which time each point will be closed:
  - End of the main,
  - Hydrants,
  - Lateral lines, and
  - Other connections as necessary.
  - i. NCDOT and OWASA's representative will witness the closing of all control valves

feeding water into the main.

- ii. The chlorine concentration shall not drop below 20 ppm within a minimum period of 48 hours.
- iii. After the 48-hour period expires, NCDOT and OWASA's representatives with the assistance of the Contractor will check the chlorine concentration to confirm that it has not dropped below 20 ppm. Day 1 samples will not be collected if the concentration is below 20 ppm after contact time has ended.

#### STEP 2: Preparing for Purity Testing

The Contractor is responsible for furnishing all material and constructing sample points.( See Standard Detail # 514.07, # 514.08, # 514.09) For Blow off 4" and larger consult OWASA Representative.

- a. OWASA's representative is responsible for preparing a Sampling Log that includes a sketch of sampling points, which is specified by OWASA's Chemist.
- b. The Contractor must ensure that each sample point terminates horizontally 18" or greater above ground level, but no more than 36".
- c. SAMPLES WILL NOT BE TAKEN FROM A HOSE.

Now the water main is ready for purity testing which includes a series of tests that must be taken on two consecutive days. The normal turnaround time for OWASA's Laboratory to acquire results is about three working days. Day 1 samples can only be taken during normal business hours on Monday, and Tuesday. Day 2 samples may be collected on Wednesday, but must be received in the OWASA Laboratory by 3:00 p.m. Samples collected but not received in the Laboratory by 3:00 p.m. on Wednesday will be considered failing and re-chlorination must be completed.

#### STEP 3: Purity Testing

OWASA is responsible for collecting and approving samples. ONCE THE CONTROL VALVE HAS BEEN OPENED AND WATER FLOW HAS BEGUN THRU THE NEW WATER MAIN THE FLOW SHALL NOT BE STOPPED, THE BLOWOFF/DISCHARGE POINT SHALL NOT BE CLOSED UNTIL ALL SAMPLES HAVE COLLECTED. THE BLOWOFF/DISCHARGE POINT SHALL NOT BE CLOSED, EITHER UNTIL THE CONTROL VALVE(S) HAVE BEEN CLOSED OR SIMUTANIOUSLY.

#### SAMPLING – DAY 1

- a. NCDOT and OWASA's Representatives with assistance from the contractor will check both chlorine concentration and turbidity.
- b. If the chlorine concentration and turbidity are within limits, OWASA's inspector will

collect samples from the new main and from an approved/control water main in the distribution system.

*Obtaining a control sample allows the laboratory to compare the water quality in the distribution system with that in the new water main.*

- c. On the day of collection, OWASA's Representative will deliver the collected sample to OWASA's Laboratory either on Monday or Tuesday before 5:00 p.m.
- d. OWASA's Laboratory personnel will conduct a Colilert® bacteriological test. This test requires 24 hours of incubation before the result is obtained. The Laboratory begins these tests around 3:30 p.m. on Monday, Tuesday and Wednesday. Samples delivered on Monday and Tuesday after 3:00 p.m. will be refrigerated and Colilert® test run the following day.
- e. The Colilert® results must be negative for coliform and E. Coli bacteria.
- i. If the samples from the water main are positive (fail), the main must be disinfected again which means Step 1 must be repeated in its entirety.
- ii. In the rare event that the samples from the control main are positive (fail), the new main must be disinfected again which means Step 1 must be repeated in its entirety.

Laboratory personnel will also conduct a Heterotrophic Plate Count (HPC) bacteriological test. This test required 48 hours incubation before the result is obtained.

The HPC result must be less than or equal to 500 CFU (colony forming units/ml).

If the results from the control main are greater than 500 CFU, the control main must be flushed and re-sampled at a later date. This is not a responsibility of the contractor to perform.

## SAMPLING – DAY 2

- a. The water main shall not be flushed again.
- b. OWASA's Inspector will check both chlorine concentration and turbidity.

If the chlorine concentration and turbidity are within the limits, OWASA's Representative will collect samples from the new main and from an approved/control water main in the distribution system. Samples will be collected from the same discharge points as in Day 1.

- c. Laboratory personnel will conduct a Colilert® bacteriological test. This test required 24 hours of incubation before the result is obtained. (If results are positive, step 1 must be repeated).

- d. In the rare event that the samples from the control main are positive (fail). The new main must be disinfected again which means Step 1 must be repeated in its entirety.

## DECHLORINATION

Water containing even very small concentrations of chlorine or chloramines is harmful to aquatic life in the receiving streams. The state standard for water entering surface waters should be below 17 ppb for total residual chlorine (NC DENR- Division of Water Quality "Red Book" Surface Water and Wetland Standards NC Administrative Code 15A NCAC 02B.0100 and .022). Therefore, no discharge of chlorinated water into a storm sewer or a stream will be permitted unless the discharge is first treated by a neutralizing chemical applied to the water to be wasted to neutralize thoroughly the residual chlorine. A de-chlorinating device is required. The use of tankers or pools to hold chlorinated water will not be permitted. Disposal of chlorinated water shall be by as outlined in the following: 1. For water with chlorine residuals between .1 and 4.0 ppm a tablet form (sodium sulfite 81.3%) of de-chlorination shall be used thru an acceptable de-fuser approved by the OWASA Representative. 2. ONLY APPLIES TO DIRECT STREAM DISCHARGE. For water with chlorine residuals between .1 and 4.0 ppm only Vita-D-Chlor tablets (ascorbic acid) shall be used if the discharged water goes directly into the stream. The appropriate de-fuser with tablet screen is required 3. For water with chlorine residuals above 4 ppm a liquid form (Calcium thiosulfate 20-30%) of de-chlorination shall be used. This chemical shall be run thru an acceptable de-fuser which allows the chemical to be gravity feed (at the appropriate rate) or siphoned (at the appropriate rate) directly into the water flow. And meet the applicable sections of AWWA C651, latest revision. See Standard Detail 514.07, *Purity Sampling Connection Detail for 2" Blow Off Line*, Standard Detail 514.08, *Purity Sampling Connection Detail on Fire Hydrant*, and Standard Detail 514.09, *Purity Sampling Connection Detail at Backflow Preventer*.

## FINAL ACCEPTANCE

Upon completion of water main installations and prior to acceptance, the Contractor shall provide adequate and competent personnel to conduct, in conjunction with the NCDOT and OWASA Representatives, an inspection of each valve and hydrant on the newly completed main. The purpose of this inspection shall be to insure the operability and location of each valve and to further insure that all valves are left in the open position.

Fire hydrants shall be greased and painted.

Flow tests are to be performed on each hydrant to verify both that flows are in line with the design flows and that all line and leg valves are open.

## MEASUREMENT AND PAYMENT

The execution of the water line construction will be incidental and will be paid at the contract unit prices of the various utility items included in the contract.